GUROBI OPTIMIZATION

Mathematical Programming

Background and relevance

GUROBI OPTIMIZATION

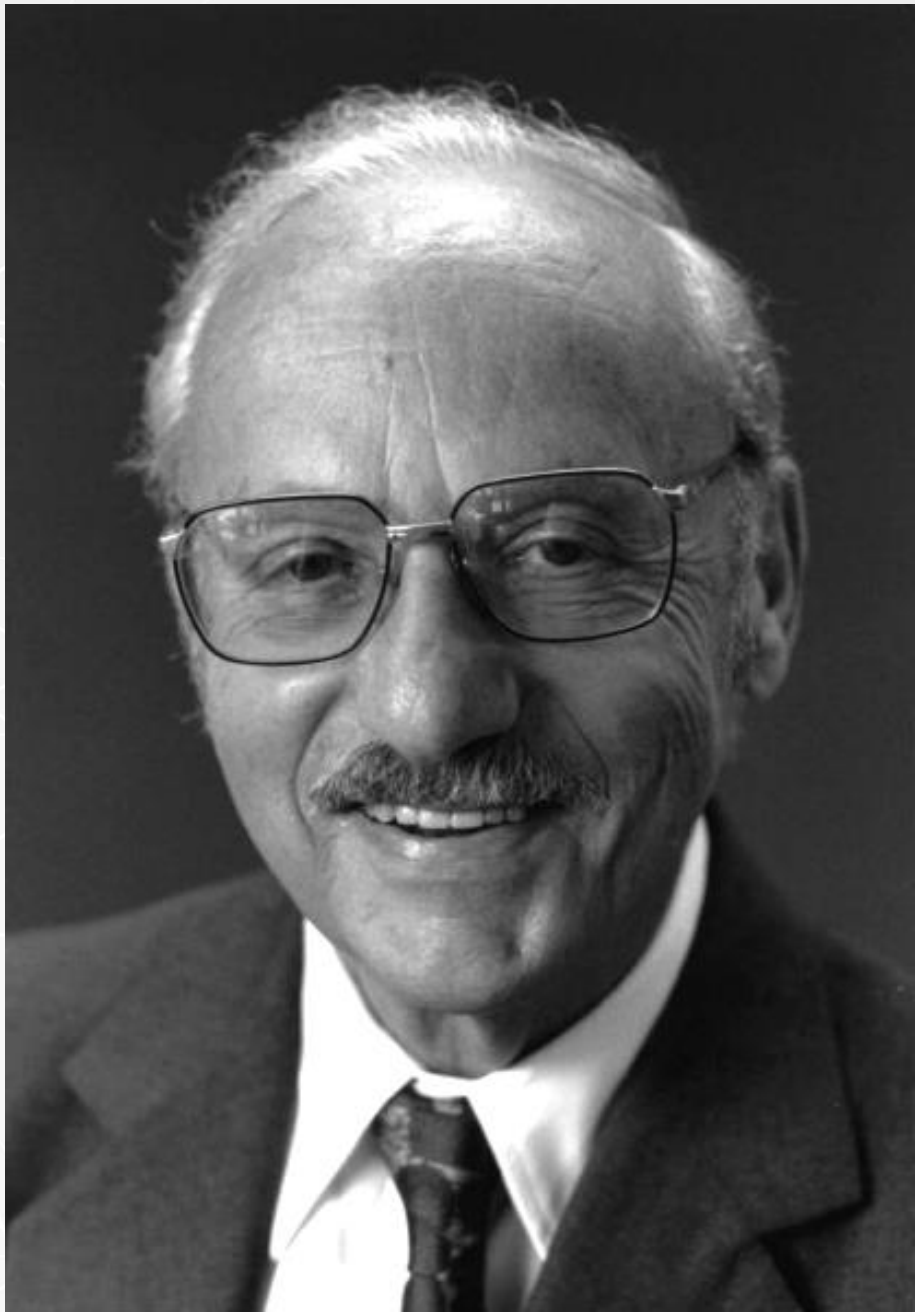
Origin of Mathematical Programming

Origin of Mathematical Programming

- **The origin of mathematical programming is the invention of linear programming in 1947, shortly after World War II.**

- **"Mathematical programming enables stating general goals and to lay out a path of detailed decisions to make in order to "best" achieve these goals when faced with a practical situation of great complexity".** –George Dantzig

- **Mathematical programming entails**
  - the formulation of real-world problems in detailed mathematical terms (models).
  - the development of techniques for solving those models (algorithms).
  - and the use of SW and HW to develop applications.



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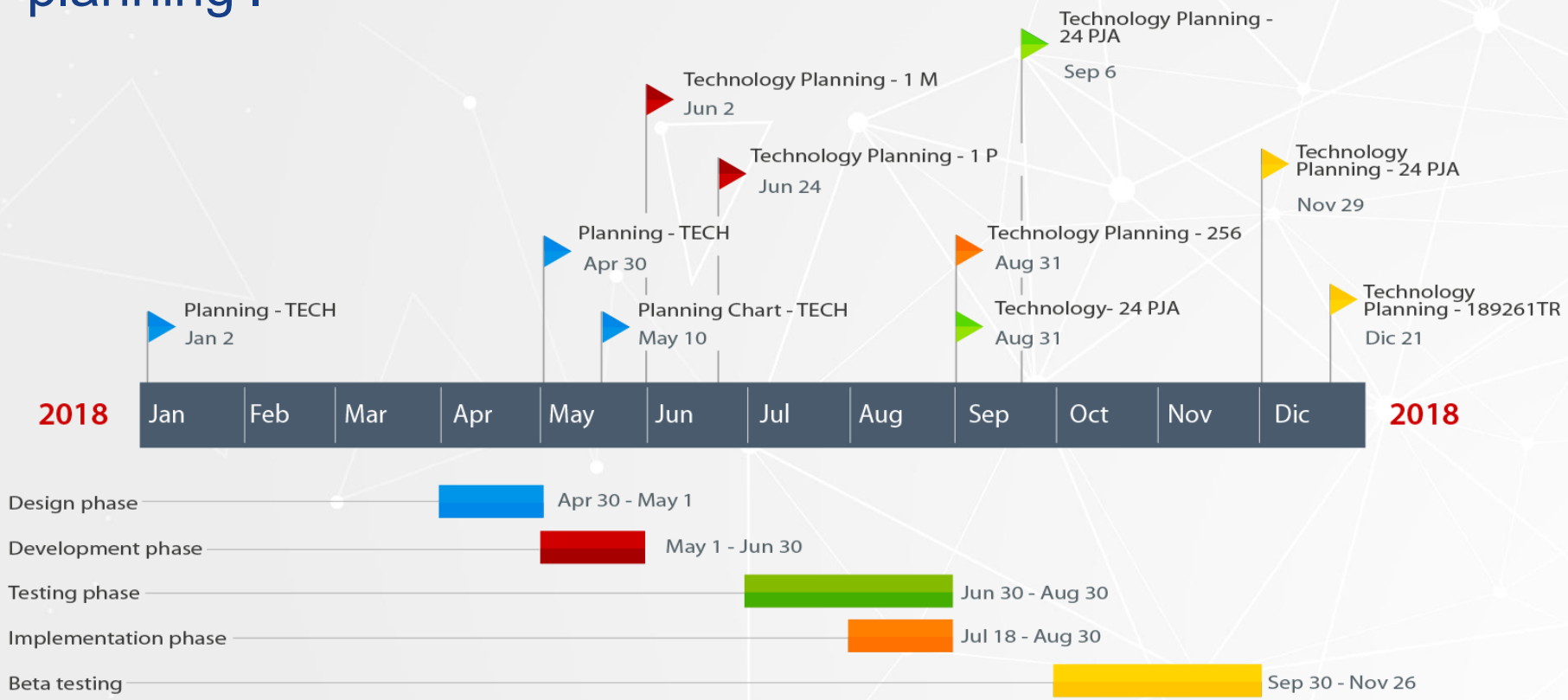
Mathematical Programming Remarks

- **It should be pointed out that mathematical programming is different from computer programming.**
  - Mathematical programming is ‘programming’ in the sense of ‘planning’.



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Mathematical Programming Remarks

- **The common feature that mathematical programming models have is that they all involve optimization.**
  - This is why mathematical programming is often called mathematical optimization.

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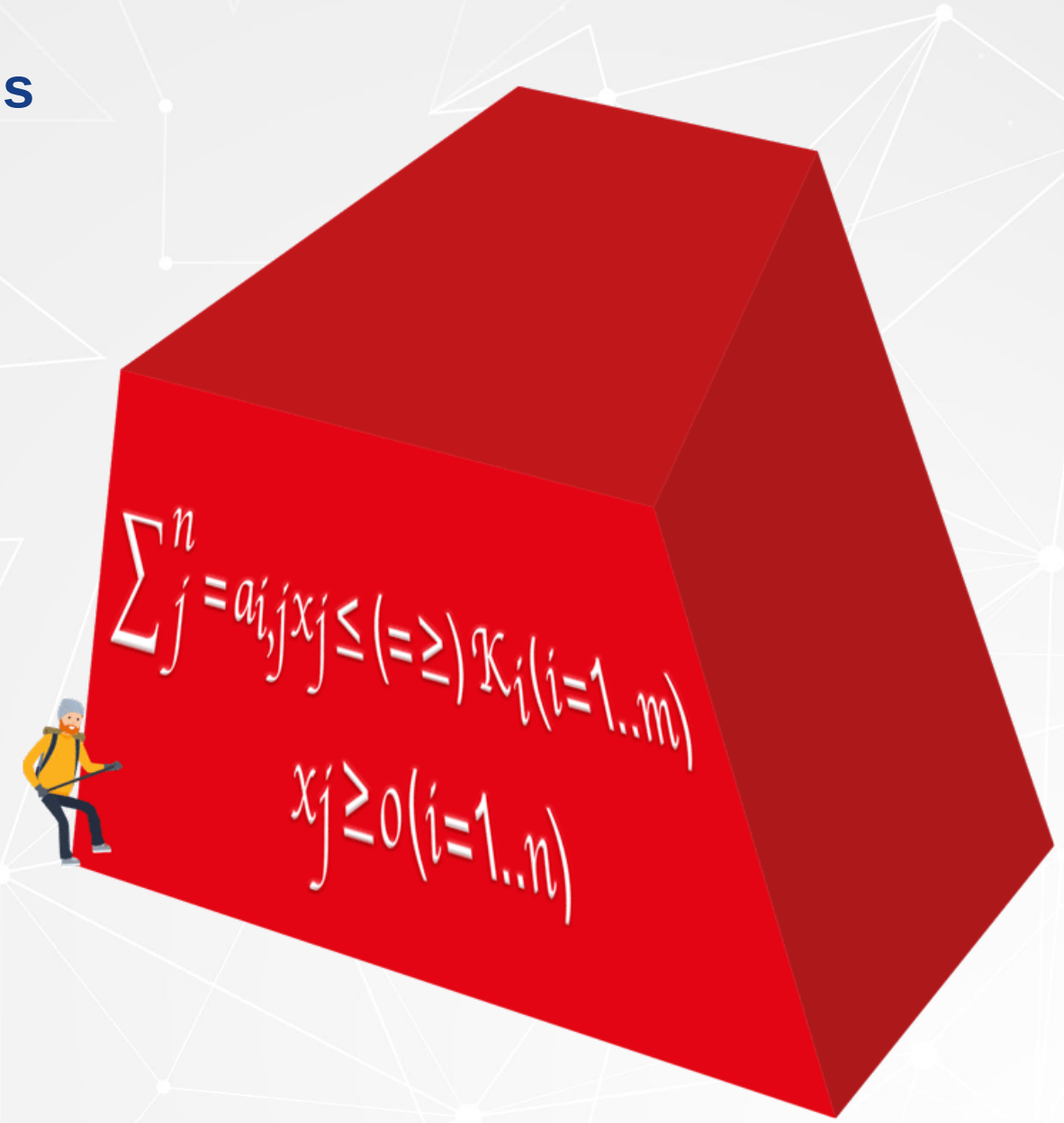
Mathematical Programming Remarks

- **In these video classes, we focus on two special types of mathematical programming models.**
  - Linear Programming (LP) models.
  - Mixed Integer linear Programming (MIP) models.



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Mathematical Programming Remarks

- Mathematical programming is a declarative approach where the modeler formulates a mathematical optimization problem that captures the key features of a complex decision problem.

- Mathematical optimization formulations can then be solved by standard LP algorithms and MIP algorithms.

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Mathematical Programming Remarks

- Gurobi users formulate mathematical optimization problems that are solved by the Gurobi callable library.
- The mathematics and computer science behind Gurobi technology are leading edge.
- Gurobi has the best performance in the market.

GUROBI OPTIMIZATION

Mathematical Programming Remarks

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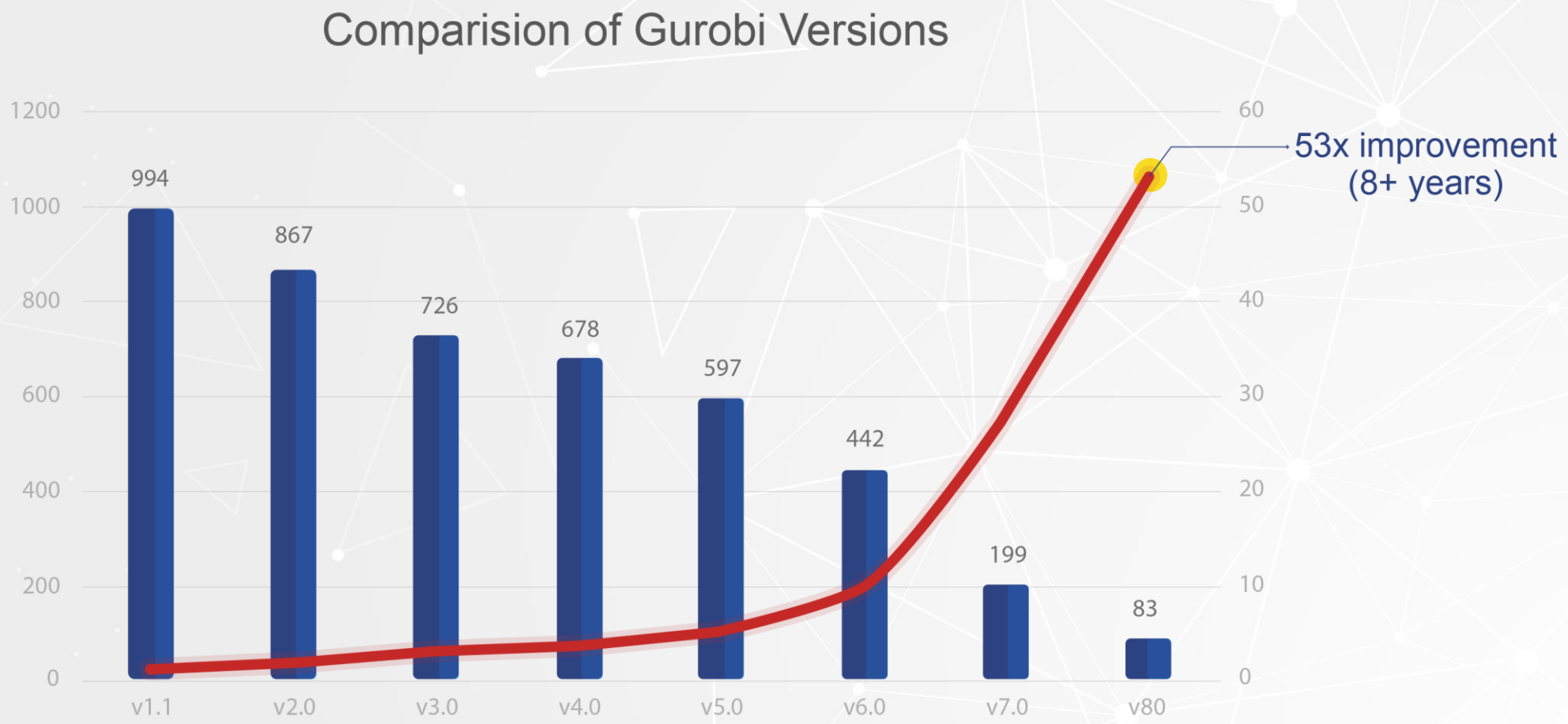

GUROBI OPTIMIZATION

Mathematical Programming Remarks

- The particular implementation of the mathematics and computer science in the Gurobi Optimizer is quite complex.
- The user does not need to worry about how to solve the optimization problem at hand, this is done automatically by Gurobi behind the scenes.
- The user only needs to have an efficient LP or MIP model that captures the main characteristics of the optimization problem and the required data for the model.